

An Address
ON
NAVAL MEDICINE IN THE
GREAT WAR

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ON

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MEDICAL PERSONNEL.

MR. PRESIDENT AND GENTLEMEN,—At the outbreak of war the permanent Medical Service of the Navy, with Sir Arthur May as Medical Director-General, was at once expanded by the mobilisation of its retired members, of officers on the emergency list, and of the medical officers of the Royal Naval Volunteer Reserve. In addition, a large number of temporary surgeons were entered, and about ten consultants were appointed, mainly to the large base hospitals. A considerable proportion of the temporary surgeons first passed through the large naval hospitals and received some instruction in naval routine and procedure. Rather later an old type of naval medical officer—viz., allied to that of surgeon's mate—was revived in the appointment of unqualified medical students who had passed their examination in anatomy and physiology, under the title of Surgeon-Probationers, R.N.V.R. They were usually appointed in batches of 15 to Haslar, where they were instructed in Service routine, accounts and returns, victualling of the sick and treatment of wounded in action, and were subsequently drafted to destroyers, which ordinarily do not carry medical officers, and to other small sea-going ships, to render first-aid. After a certain period of service many of them were granted leave to prepare for and pass their final examinations, and so to become temporary surgeons.

The work of the clinical laboratories of the large base hospitals was assisted by the utilisation of men with laboratory knowledge but without medical qualifications, who, however, did not receive naval rank. Dr. P. Fildes was sent to Haslar by the Medical Research Committee and was of the greatest use in dealing with the bacteriological

examination of the numerous convalescents from dysentery, enteric fever, and other intestinal diseases sent from Gallipoli.

Queen Alexandra's Royal Naval Nursing Service was more than trebled by the mobilisation of the reserve nursing sisters. The number of nursing sisters at the large base hospitals was thus very largely increased and they were supplied to the hospital ships, which usually carry four nursing sisters, two regulars and two reserves. The existing sick-berth staff, which was considerably depleted when the Fleet was mobilised, was supplemented by the Naval Auxiliary Sick Berth Reserve, composed mainly of men from the St. John Ambulance Brigade.

TRANSPORT OF THE WOUNDED AND SICK.

Transport duties are familiar to naval officers, and their services have naturally been utilised during the war. The naval transport, both at home and abroad, has been under the control of Surgeon-General Sir James Porter, K.C.B., who, early in 1915, went out to supervise the transport arrangements in Gallipoli for the Army as well as the Navy. Fresh developments in methods of transport, such as a new ambulance sling (Boydon), a monowheel stretcher-carrier (Rev. B. Close), the use of the movable-cot system on ambulance trains, and improvements on hospital ships have been evolved.

Ambulance trains.—Of the four naval ambulance trains in use at present in this country, the larger ones, made up of 12 coaches and carrying 120 cot cases, travel from the north to the south as occasion requires, in ordinary times about twice in ten days. Once a week they take the patients off the hospital ships, and rather less often they collect patients from the naval hospitals in the vicinity of the naval bases. The patients are dropped in succession at the large naval hospitals, Plymouth, Haslar, Chatham, and occasionally at Portland. These, colloquially called "round" trains, carry two medical officers, a crew of 36 stewards and sick-berth attendants, but no female nurses. Two padded rooms are provided for the reception of lunatics. A small ambulance train of six coaches, called "the shuttle," travels locally between the naval bases and the local hospitals. Sir James Porter and Acting Staff-Surgeon A. V. Elder, R.N.V.R., devised a plan whereby the Service cot, into which the patient is placed in his own ship or in the hospital ship, is securely suspended and lashed up against the fender at the side of the coach in the ambulance train, thus avoiding the fatigue necessitated by transfer from a stretcher to a fixed cot in the ambulance train.

Hospital ships.—The experience of the present war has

somewhat modified previous conceptions of the uses of hospital ships. In peace-time a hospital ship accompanies the Fleet and serves as a mobile base hospital until it becomes full, when she leaves the Fleet in order to discharge the patients to a land hospital, and for the time acts as a marine medical transport, or, in other words, a marine ambulance (Elder¹). In the South African War (1899–1902), in the transport of wounded and sick across the Channel, and in the case of their service between the Mediterranean and this country at the present time, our hospital ships did, and now, act as “Marine Ambulances”; and in the Russo-Japanese War (1904–5) the two Japanese naval hospital ships worked on these lines. In modern naval engagements, contrary to what might have been anticipated,² the hospital ships cannot accompany the Fleet and take charge of the wounded for the following reasons: (1) the hospital ships could not keep up with the rapidly moving battleships; (2) the transfer of wounded from a battleship to the hospital ship would be possible only in exceptionally calm conditions; and (3) the transfer of wounded would oblige the battleship to heave to, and thus expose it to hostile submarine attack. In order to meet this want it has been suggested that fast vessels of about 500 tons, registered under the Geneva Convention, and fitted with appliances for rapidly picking up survivors from the sea, should be employed on the scene of a recent action. But this plan has not been put into effect.

The use of hospital ships in war-time may, as Elder points out, be divided into: 1. The intervals between actions, during which the hospital ship remains at the naval base until it is full—for four or more weeks—and then discharges its patients, by steaming to a railhead, to an ambulance train. During its stay at the naval base the load of the hospital ship may be lightened from time to time, and its stay thus prolonged, by evacuation of some patients to a hospital carrier which conveys them to a land hospital or ambulance train. A large number of surgical operations are performed in a hospital ship during its stationary period at a naval base and minor cases when cured return to duty in the Fleet.

2. The post-action phase, when the hospital ships are collected at the naval bases to await the arrival of the battleships, receive the wounded, and serve as clearing stations. The wounded and burnt are sorted and as rapidly as possible evacuated to the shore and to the ambulance trains. Severe cases, which would obviously suffer from transport, are taken

¹ Elder. A. V.: On Hospital Ships and Their Functions, Jour. Roy. Nav. Med. Service, 1916, ii., 443.

² At the Battle of the Yellow Sea on August 10th, 1904, the Russian hospital ships followed their Fleet, and, as the Japanese point out, ran the risk of being accidentally torpedoed. (The Surgical and Medical History of the Naval War between Japan and Russia (1904–1905), 1911, pp. 121, 150.)

to the comparatively small hospitals in the immediate neighbourhood, but all suitable cases are at once despatched by the ambulance trains to the large base hospitals in the south of England, so as to clear the land hospitals in the vicinity of the naval bases for the reception of further instalments of wounded.

Immediately after a battle, therefore, a hospital ship ceases to act as a base hospital and becomes a clearing station, and should be evacuated as rapidly as possible, as their capacity for cot cases—on an average 250—does not admit of any extension. It should be added that a hospital ship may be employed as a permanent floating hospital for infectious diseases at a naval base which is remote from such hospitals on land.

Hospital ships, like ambulance trains, had to be brought into being when war broke out, and were provided by the transformation of liners. They were staffed by the existing executive crews of the company and by naval medical officers, with a Fleet-Surgeon in charge, and with nursing sisters.

THE HEALTH OF THE NAVY.

In considering this subject a distinction may conveniently be made between the health of (i.) the shore depôts and training establishments; (ii.) the Service afloat; and (iii.) the Royal Naval Division and the Marines serving on land.

I.—*The Shore Depôts and Training Establishments.*

The barracks, depôts, and training establishments are more exposed than the Service afloat to invasion by epidemic and other infections on account of their contact with the civilian population, the influx of new entries, and, especially in the case of the boy-training establishments, by the massing together of large numbers of youths who are more susceptible than adults to many of the common epidemic affections. Further, the health of the Fleet has been protected by the adoption of quarantine measures as regards drafts sent to it from the shore depôts. The liability of the shore establishments to epidemic disease is shown by the incidence of cerebro-spinal fever; out of 274 cases in the Navy during the first two years of the war, 252, or 92 per cent., occurred on shore; thus, there were 63 in the Portsmouth area, 58 in the Plymouth area (including 22 cases from boy-training ships), 42 at the Crystal Palace depôt, 39 in the Chatham area, 27 at the Deal depôt, and 18 at Shotley.³ Shetlanders in barracks suffered much from

³ THE LANCET, 1915, ii., 909; 1917, i., 54.

measles, probably on account of the absence of any racial immunity to this disease.

II.—*The Service Afloat.*

The health of the Fleet—our first line of defence—is of such paramount importance that it demands more detailed description. Under this heading reference will be made first to the Grand Fleet in home waters and then to the Mediterranean Fleet.

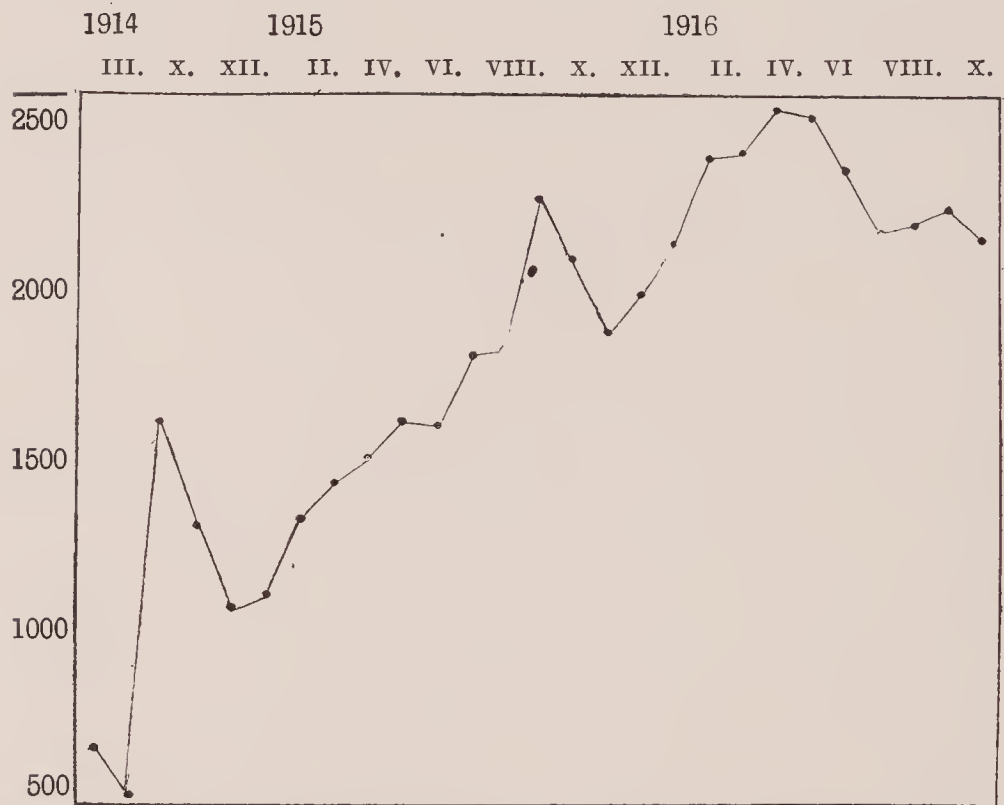
The Grand Fleet.—The general health of the Grand Fleet has been extremely good, indeed probably better than in times of peace. The average daily percentage of sick in the whole Fleet in 1913 was 2·37, and in 1914 a little lower, 2·03. Since the outset of war cases of sickness have naturally been sent off to hospital more rapidly than in peace time, and thus the daily sickness in the Fleet is diminished. But even allowing for this, the average daily sickness in the Grand Fleet has been extremely low, almost always under 1 per cent., and indeed has fallen since the outbreak of war. This percentage incidence would have been even less had it not been for the higher rate of sickness among the reservists and pensioners. Most of the sickness was of a minor character, such as seasonal influenza and boils.

Infectious diseases.—Measles, mumps, rubella, scarlet fever, and diphtheria occurred, but in the majority of instances they subsided after the appearance of the initial cases. An interesting point was the severity of measles among the Shetlanders both on the Fleet and among the reservists stationed at Lerwick, where there was a severe epidemic early in 1915 (McVittie). In ordinary times measles is rarely seen in the Shetlands, but when it is introduced an epidemic results. This severity of the disease in a race unprotected against it recalls the devastating epidemics of measles in the adjacent Farøe Islands in 1781 and 1846, in Fiji in 1875 and 1907, and in the neighbouring island of Rotumá in 1911 (Corney⁴). Dr. R. P. Heddle, medical officer of health of Kirkwall, writes that in some of the Orkneys measles is often absent for 15 or 20 years, and that when it occurs the children have it in much the same manner as in the south, but that adults take it severely and often suffer from pneumonia and occasionally from meningitis. I saw a relapse of measles in a Shetlander on the twenty-eighth day of the disease at Chatham—an extremely rare event. No case of small-pox occurred in the Fleet, thus showing the value of vaccination which has been compulsory in the Navy since about 1858. Except in the Mediterranean

⁴ Corney : *Proc. Roy. Soc. Med.*, 1913, vi. (Sect. Epidem.), 138.

Fleet there were very few cases of enteric fever. Small outbreaks in three ships were traced respectively to infected oysters dredged up from Langstone Harbour, near Portsmouth, to a carrier, and probably to contaminated water taken on board at Montreal.

With the prolongation of the war it would naturally be expected that the amount of sickness would increase, and study of a curve showing the monthly average of officers and men in the large naval hospitals, Chatham, Haslar, Plymouth, for the figures of which I am indebted to Surgeon-General D. T. Hoskyn, Surgeon-General G. Welch, and Surgeon-General W. H. Norman, shows that, allowing for two peaks due to extraneous causes (campaigns on land), there was a gradual rise from the beginning of the war until April, 1916, after which there came a slight fall. This would at first sight appear to confirm the anticipation of increased sickness. But, as already mentioned, the daily average percentage of sick in the Fleet had fallen during this period,



Graph of the monthly daily average of officers and men of all naval branches in the large naval hospitals at Chatham, Haslar, and Plymouth. The steep rise in October, 1914, was due to the admission of a large number of Belgian officers and men. The rise in September and October, 1915, was coincident with a large influx of patients from the Royal Naval Division on Gallipoli.

and it is therefore probable that the absolute increase of sickness, as shown by returns of the hospitals, is mainly due to the steady increase in the strength of the Navy during the progress of the war. Although there are, of course, no official

figures obtainable as to the present strength of the Navy, it may well have so increased as to account for the doubling of the absolute number of sick, while the relative percentage incidence in the Grand Fleet has even fallen.

The Mediterranean Fleet.—In the Eastern Mediterranean squadron during August, October, and November, 1915, almost every ship was attacked by epidemic gastro-enteritis, which, however, died down in December. There was a fair number of cases of typhoid, paratyphoid, and dysentery between August and the end of December, 1915. The dysentery was mainly amœbic, and in many cases was associated with jaundice. The infection of these diseases was probably conveyed by flies and by men returning from the beach. The health of the Adriatic squadron at this time was excellent, and the average daily sickness for the whole Mediterranean Fleet from August 15th, 1915, to Oct. 31st, 1915, was 2·24 per cent., and from Nov. 1st, 1915, to Jan. 31st, 1916, 1·52. This compares favourably with a daily percentage of 2·37 sick for the whole Fleet in 1913. From Feb. 1st to April 30th, 1916, the health of the Fleet was even better with a daily percentage of 1. Between May 1st and July 31st, 1916, the daily average of sick was 1·14 per cent. A mild form of pyrexia (sand-fly fever) was prevalent at Salonika in May and appeared in some of the ships in the Eastern Mediterranean, and at intervals cases of paratyphoid, dysentery, and malaria occurred. In the quarter ending Oct. 31st, 1916, the daily percentage of sick was 1·08; dysentery and malaria were less frequent than in the previous three months, and typhoid and paratyphoid rare. No cases of beri-beri have been reported from the Mediterranean Fleet. For this information I am indebted to Sir A. May and his assistant, Fleet-Surgeon W. L. Martin, R.N.

During August and September, 1915, there was an extensive epidemic of dengue at Bermuda, and the average incidence of the disease in men of war there was 3 per cent. only. Meagher's⁵ observations there support the view that the disease is spread by mosquitoes.

The good bill of health of the Fleet as a whole—a tribute to preventive medicine—is due to the following factors: 1. The comparative isolation of the fleets, and especially of the Grand Fleet, thus necessitating absence of venereal disease and of opportunities for alcoholic excess incident to the temptations of seaports. In the Fleet the men's daily allowance of stimulant is half a gill of rum, and special precautions are taken to prevent the adsorption of unused allowances by other men. 2. The quarantine precautions in drafting from the shore establishments to the Fleet, instituted by the Medical Director-General, Sir Arthur May.

⁵ Meagher: Journ. Roy. Nav. Med. Service, 1916, ii., 188.

3. The lectures given by the medical officers to the ships' crews on personal hygiene, dealing especially with the dangers of venereal disease and alcoholic excess. These lectures appealed to the common sense of the men, and as an illustration of their good effect it may be mentioned that on the return from leave of the men (about 1100) of one great battleship there were only three cases of gonorrhœa and one of syphilis. 4. Measures to obviate the effects of monotony entailed by awaiting events which have been long anticipated. Thus, when possible, regattas, boxing competitions, and other entertainments are got up, and both by their preparation and performance brighten up the men. In the Grand Fleet the short days of winter are the most trying, and then, in addition to entertainments, lectures, for example, by those who have made visits to the front in France, and cinema shows serve a useful purpose. Each big ship has its cinema, and there is a scheme of circulating films between the various ships. Periodical leave is also provided. 5. Improvement in the ventilation of the ships, due to the adoption in 1914 of the recommendations of a committee, of which Fleet-Surgeon R. C. Munday was the secretary, appointed in October, 1912, to consider the best methods of ventilating modern warships.

Influence of mobilisation and war on the health of the navy.—After this summary of the satisfactory state of the health of the Fleet a few words may be said as to the bad influence which mobilisation and war might be expected to exert on the health of the Navy. Large numbers, running into tens of thousands of men of the Royal Naval Volunteer Reserve, the Royal Naval Reserve, and the Fleet Reserve were called up and had necessarily to be rapidly passed into the ships during the first few days of the war, and as a result a certain proportion of unfit slipped through. The incidence of sickness was therefore naturally much higher in the Royal Naval Volunteer Reserve and Royal Naval Reserve than in the Royal Navy, which may be regarded as a picked body of healthy men. Cases of failure of cardiac compensation, of relapses in pulmonary tuberculosis, and of diseases which had previously led to discharge from the service were not infrequent, and dental caries and insufficiency extremely common. As cases of organic valvular disease of the heart are invalided out of the service, malignant endocarditis, which usually supervenes on existing valvular disease, is a rare disease in peace time—averaging about two cases a year. Since the outbreak of war I have seen ten fatal cases (six examined post mortem) and one of that exceptional but allied condition malignant aortitis, chiefly but not entirely in reservists and pensioners.

In addition to the cases in the Navy a case occurred at Haslar of acute malignant endocarditis in a Belgian soldier

who was for months under treatment for severe burns; after being normal for a long time the temperature suddenly shot up and the patient died in 12 days with, as the necropsy proved, acute malignant endocarditis. The interest of the case is that the onset and duration of the disease could be accurately determined.

The numerous new entries, mostly quite young, who are exposed to the depressing conditions incident to their change of life, such as vaccination, the fatigue of unaccustomed drills, and homesickness, provide a favourable soil for the occurrence of infectious diseases, such as measles, rubella, scarlet fever, mumps, and cerebro-spinal fever. Outbreaks of infectious diseases occurred, but it is remarkable that there was not more illness.

The effect of long-continued strain on men, especially pensioners and reservists, in activating latent disease, such as tuberculosis or heart disease, was naturally seen. In the Navy these two conditions lead to invaliding, and their recrudescence was therefore more frequent among reservists and pensioners called up for the duration of the war. Pulmonary tuberculosis in ships was not so frequent as some anticipated from the conditions necessitated by the war.

Strain, physical and mental, precipitated *tabes dorsalis* and general paralysis of the insane in some syphilitic subjects; and a generous view from the pension aspect has been adopted by the Admiralty. Some cases of incipient *tabes* have been utilised by work of a less arduous physical character. During the siege of Paris in 1870 it was noted that exophthalmic goitre became more frequent, and this has appeared to me to be true, both during the Boer War and the present campaign. Much discussion has taken place as to the influence of hyperthyroidism in the etiology of the so-called soldier's heart. Over-excitation of the ductless glands may result from excitement or from toxæmia due to acute infections; and Hurst⁶ points out that as over-activity of the thyroid can be more early recognised than that of the other ductless glands the resulting condition has been regarded as simple hyperthyroidism, but that the change is more complex, being really a disturbance in the activity of all the ductless glands. Diabetes mellitus, the incidence of which might conceivably be favoured by nervous strain, does not appear to me to have become unduly frequent.

The prolonged and monotonous strain necessitated by life in the Fleet favours mental deterioration, psychasthenia, and neurasthenia, especially in those with a neurotic taint and in those who have not been through a long training. Further, the short interludes of acute stress and excitement which punctuate the periods of monotonous alertness may so disturb

⁶ Hurst, A. F.: *Medical Diseases of the War*, p. 127, 1917.

the already vibrating balance as to precipitate an acute breakdown with violent though transient symptoms and delusions. The burden of responsibility and in a small ship the influence of comparative isolation on the senior officer favour mental instability, and may lead to a want of self-confidence bred of brain-fag. In an interesting psychological study of the influence of periods of (1) monotonous watchfulness, (2) acute stress, and (3) comparative calm on a ship's company during the first six months of the war, Beaton⁷ found that mental troubles of a really serious nature occurred in less than 1 per cent. and mild neurasthenic conditions in less than 4 per cent. With the prolongation of the war the results of the continued and monotonous strain would naturally be expected to become more noticeable, but, as far as my impression goes, not to anything like the extent that would have been expected. This happy result is no doubt due to several factors—the fine spirit of confident superiority in the men, and the hygienic measures already mentioned. The effect of good moral in preventing mental disturbance was seen by the freedom of the men from these manifestations after the Jutland Battle.

Casualties during action.—With this subject I can attempt to deal in very brief and imperfect outline only. As compared with land warfare, the large number of men killed outright in naval actions is striking. In the Russo-Japanese naval war of 1904–05 there were 3692 killed and wounded, of whom 1883 were killed outright (including 1388 probably drowned⁸). It is not considered advisable in the public interest to give the figures for the Battle of Jutland, but from the total loss of battleships the numbers of men presumed to be drowned, though, of course, many in the sunk ships may have been killed, wounded, or burnt, must obviously have been very large.

Wounds.—As compared with wounds in the trenches, where the clothing and skin are ingrained with filth, wounds in naval actions obviously differ, and have been classed with those of severe machinery accidents. Wounds of soft parts and compound fractures were due to shells, their splinters, shrapnel, and fragments of the ships' structures. Several cases of eye injuries necessitated enucleation, and in one remarkable instance an eye was found to contain a piece of bone $\frac{3}{4}$ inch square, apparently from the vault of another man's skull (L. Fraser⁹). The treatment of wounds by new antiseptic applications has been advocated by Sir Watson Cheyne (borsal), who also

⁷ Beaton, T.: Jour. Roy. Nav. Med. Serv., 1915, i., 447.

⁸ The Medical and Surgical History of the Naval War between Japan and Russia (1904–1905), 1911, p. 588.

⁹ Fraser, L.: Journ. Roy. Nav. Med. Serv., 1916, ii., 440.

investigated Dakin's antiseptic, and a green spray of perchloride of mercury and malachite green (Fildes, Rajchman, and Cheate¹⁰) has been used with success at Haslar. The rival claims of the antiseptic method and of the physiological hypertonic salt solution treatment have led to an encounter between the President of the Royal College of Surgeons and Sir Almroth Wright.

Burns form an important proportion—at least a third—of the casualties in action, and fall into two main categories: 1. General and severe burns due to the ignition of our own cordite or to burning furniture. As the result of prolonged exposure to these flames destruction of the tissues is deep, the immediate mortality high, and sepsis and deformity especially prone to occur. 2. Burns of the exposed skin of the face and hands due to the momentary flash of high-explosive shells in a confined space. The flash is of such short duration that from instinctive closure the eyes escape, and the thinnest covering, provided it is not inflammable, almost completely protects the skin (Muir¹¹). In the *Lion* about half the wounded had burns of the face and hands alone (Maclean and Stephens¹²). There seems to have been a general agreement that the Service picric-acid dressing was most efficacious as a first application, but subsequently moist and mild antiseptics were found to be more suitable. The new treatment by ambrine is now officially provided.¹³

Shock, even in cases of slight injury, was found to be excessive, and for this reason immediate operations should be avoided (Muir). As a means of obviating shock morphine proved a sheet-anchor, $\frac{1}{2}$ to $\frac{2}{3}$ grain being injected hypodermically. The sublingual method of allowing tablets to dissolve under the tongue, which is convenient as it does not necessitate the presence of a medical officer—the tablets being served out by an executive officer—was not satisfactory. The administration of $\frac{1}{2}$ pint of warm bovril containing 2 oz. of brandy proved beneficial in the *Tiger* in the Jutland Battle.

Poisoning by gases from explosives.—The detonation of shells such as lyddite and the burning of our own cordite liberate large quantities of CO and CO₂, but the most powerful factor in the production of "gassing" is nitric oxide. The symptoms usually come on after a comparatively uneventful interval; and possibly during this incubation period the NO and NO₂ are oxidised into nitric acid (Symons¹⁴), which accounts for the acute irritant effects on

¹⁰ THE LANCET, 1915, ii., 165.

¹¹ Muir: Journ. Roy. Nav. Med. Service, 1916, ii., 415.

¹² Maclean and Stephens: Ibid., 1916, ii., 425.

¹³ THE LANCET, 1917, i., 201.

¹⁴ Symons: Journ. Roy. Nav. Med. Service, 1916, ii., 516.

the respiratory tract. Severe headache and vomiting are early symptoms, followed by cough, husky voice, dyspnoea and cyanosis which become progressively worse, rapid respirations reaching 80 or more per minute, restlessness, pain and tightness behind the sternum, orthopnoea, frothy, sometimes blood-stained expectoration, and oedema of the lungs. Prophylactic treatment is most important and quite effective; it consists in the immediate application of the Service respirator containing cotton-waste soaked in the usual soda solution. The respirator should be worn round the neck from the beginning of the action, so as to lose no time in putting it in position. The treatment of the declared condition is unsatisfactory. Though theoretically attractive, atropine does not appear to have been successful. Some benefit has been ascribed to brandy, the production of vomiting, and the repeated administration of spiritus ammoniæ aromaticus in 1 oz. of water.

Cases of carbon monoxide poisoning occurred, and I had the opportunity of seeing three cases among men employed in putting out a fire in the bunkers of a collier. One of these presented curious nervous symptoms, resembling in some respects peripheral neuritis but more probably functional in nature, which persisted for two years.

Delayed pneumonia after immersion was noticed by Deputy Surgeon-General H. W. G. Doyne in some cases after the sinking of the *Cressy*, *Pathfinder*, and *Hermes*. Pneumonia occurred about three weeks after the immersion.

Appendicitis is not rare in the Navy in peace-time; before the war it occurred in about 0·2 per cent. of the personnel of the Navy. Since the war began it is impossible to give the percentage, but it is by no means uncommon. I am indebted to Surgeon C. J. G. Taylor, R.N.V.R., for figures which show a decided percentage increase in the incidence of appendicitis directly after the Battle of Jutland among the sick from the engaged ships. He also points out that there was a similar rise in the incidence of appendicitis directly after a sweep of the Fleet in the North Sea when contact with the German Fleet was almost established. On the other hand, when the Hospital Ship *Soudan*, in which he served, was present at the opening stages of the Gallipoli operations, and the men were exposed to conditions of naval warfare, the incidence of appendicitis among 11,619 cases of wounds, sickness, and accident was low—viz., 0·2 per cent.

III.—*The Royal Naval Division.*

The Royal Naval Division served in Belgium, Gallipoli, and is now in France under the Army. The Marines also fought on land in Mesopotamia. The naval forces have therefore been exposed to the same infections and diseases as the armies with whom they have been associated. The contrast between the incidence of disease in the Service

afloat and the Naval Divisions on land is as striking as that between the conditions of naval and military warfare generally. Even if statistics were available, it would be impossible to deal fully with the diseases among the Naval Division in Gallipoli, as this would be equivalent to a consideration of military medicine, but a few points of interest may be mentioned.

As has always been the experience in war until quite recently, diseases due to infection through the alimentary canal—diarrhoea, typhoid, paratyphoid, dysentery, and jaundice—levied a heavy toll in Gallipoli, and a large number of men were invalided to this country.

Diarrhoea was so frequent that it was regarded as an incident rather than a cause of going sick, and a solid motion was the exception rather than the rule on the Peninsula; men might go to the latrines ten times daily for months without reporting themselves as sick. As it was common when sand-storms were prevalent, it was called sand diarrhoea, but it is probable that it was not entirely due to the purely mechanical irritation of the sand, but that the sand conveyed micro-organisms into the food, and that flies, which were a veritable plague at Gallipoli, may have played a carrier part in the infection of food.

Dysentery, the amoebic and bacillary forms being predominant at different periods, claimed many victims, but the treatment by émetine and antidysenteric serum gave very satisfactory results. Indeed, many cases of amoebic dysentery appeared to have been cured by the time they arrived in this country, and thus amoebic dysentery appeared, as judged by the observations in this country, to be less common than it was reported to be in the Eastern Mediterranean. Among 143 cases in 1916 in which Mr. H. A. Baylis found protozoa in the faeces, 29, or 20 per cent., showed *Entamoeba histolytica*. Emetine was freely given, and in some instances the question arose whether subsequent palpitation, breathlessness, arrhythmia, and precordial pain were due to the poisonous effects of the acute infection, excessive smoking, or the remedy emetine; for experimentally emetine has been found to produce ventricular fibrillation (Levy and Rowntree). It is interesting to note other bad effects of this successful drug—peripheral neuritis and chronic diarrhoea with or without blood which must be distinguished from a recurrence of dysentery. On the other hand, the freedom with which emetine was given may have been responsible for the rarity of hepatic abscess. Three cases of entamoebæ in the urine with temporary vesical irritation, possibly due to rupture of a small pericolic amoebic abscess into the bladder, came under my notice. Urinary amoebiasis has apparently seldom been observed, as Scott Macfie¹⁵ refers to 15 cases only.

¹⁵ Scott Macfie: Ann. Trop. Med. and Parasit., Liverpool, 1916, x., 291.

Bacillary dysentery as judged by a series of late convalescent cases examined serologically by Dr. P. Fildes was found to be more often—in the proportion of 8 to 1—due to Flexner's bacillus than to Shiga's. This seems to be contrary to the general experience in Gallipoli, but the conditions of the acute infection in which the bacilli can be isolated from the fæces and of late convalescence when the agglutination reactions were performed are not really comparable. The diagnosis with which patients arrived in this country was often changed as the result of laboratory examination, and sometimes mixed infections were discovered. Among 481 cases which gave positive agglutinations pointing to bacillary infections of the alimentary canal examined at Haslar, some of which were multiple, Dr. Fildes found that 30 per cent. were due to *B. typhosus*, 23 per cent. to *B. paratyphosus A*, 20 per cent. to *B. paratyphosus B*, 22 per cent. to *B. dysenteriae* Flexner, and 0·3 to *B. dysenteriae* Shiga.

A large number of patients were invalided home with intestinal symptoms clinically described as paratyphoid or dysentery which, however, could not be serologically or bacteriologically proved to be due to any known infection, and were therefore labelled by the non-committal term of "enteritis." The antityphoid inoculation was fully justified by results.¹⁶ Much bacteriological work was necessitated in the testing of patients sent home for intestinal diseases in order to prevent the escape of carriers into the general population. The increase in the number of patients in the large naval hospitals due to this cause is shown by the peak on the chart during September and October, 1915.

Epidemic jaundice, apparently imported from Egypt, was very common in Gallipoli at the end of 1915. The degree of the jaundice did not run parallel with the malaise, for men considerably bronzed continued at work while others with but slight icterus were obliged to go sick. Its etiology gave rise to much discussion; from the freedom of many patients from preceding gastro-enteritis (McBean Ross,¹⁷ Hurst¹⁸) it seemed unlikely that it was catarrhal jaundice in an epidemic form. Similarly there was no evidence that it was due to dysentery or enteric fever. In some instances it followed these diseases, but usually after an interval as an accidental event. I have seen it develop in England in convalescent dysenteric and typhoid patients. The suggestion that it was due to paratyphoid (*B. paratyphosus dardanellensis*) infection of the biliary system has not been substantiated. Hurst regards the disease as an

¹⁶ Vide Bassett-Smith: Journ. Roy. Nav. Med. Service, 1917, iii., 30.

¹⁷ McBean Ross: Ibid., 1916, ii., 317.

¹⁸ Hurst, A. F.: Medical Diseases of the War, p. 104, 1917.

acute infection of the duodenum by an organism allied to *B. paratyphosus A*, which should therefore be treated with the same precautions as enteric fever. The only necropsy that I have seen showed severe gastro-enteritis with a plug of tenacious mucus in the orifice of the biliary papilla. Dilatation of the heart was a definite feature, and peripheral neuritis (beri-beri) was noted as a not infrequent sequel. In one case under my care glycosuria followed the jaundice.

A form of peripheral neuritis identical with beri-beri in its clinical aspects occurred in Gallipoli and in Mesopotamia; 12 cases of beri-beri were treated at the Royal Naval Hospital, Plymouth, in 1915-16, and at least 15 such cases at Haslar during the same period. In this outbreak the usual etiological explanation of beri-beri—namely, the absence of the specific vitamine—presented difficulties; but Willcox,¹⁹ who recognised that jaundice often preceded this beri-beri, supported the deficiency hypothesis of the disease by the explanation that the diet suitable for jaundice, diarrhoea, dysentery, and paratyphoid fever contains extremely little, and that tinned food is almost entirely devoid of the anti-beri-beri vitamine which is destroyed by a temperature of 130° C. An ingenious hypothesis was put forward by A. F. Hurst, who revived Hamilton Wright's view that beri-beri is the result of a specific infection of the duodenum, the toxins produced by which exert a special action on the nervous system. As the epidemic jaundice in Gallipoli was regarded as the result of such a duodenitis, which, however, did not always obstruct the common bile-duct, the occurrence of this beri-beri-like neuritis after jaundice, or even without previous icterus, can be thus explained, and the necessity of relying entirely on a deficiency in vitamins in the food is no longer binding. The dilatation of the heart and dropsy, which were marked features of some cases of beri-beri seen in Haslar, can thus be correlated with the dilated heart described in the epidemic jaundice.

Other fevers occurred in Gallipoli and Salonika, such as malaria, which was recently prevalent among the Royal Naval Air Service at Thasos and Cassandra in the autumn of 1916, both the forms of trench fever, and sand-fly fever. The value of anti-choleraic inoculation and of the efforts of the Health Department at the Dardanelles was shown by the freedom of the Royal Naval Division from cholera and plague, which Deputy Surgeon-General O. W. Andrews tells me were prevalent among the Turks in the immediate neighbourhood.

War nephritis and trench or Gallipoli sore, apparently analogous to the veldt sore in the South African War, and

¹⁹ Willcox: Journ. Roy. Army Med. Corps, 1916, xxvii., 191; and THE LANCET, 1916, i., 555.

due to a Gram-positive diplococcus (Archibald, Hadfield, Logan, and Campbell²⁰), were also reported.

A considerable number of bullet wounds of the chest with resulting *hæmothorax* were under observation at Haslar during the early part of the war, and as a rule were watched and not explored unless there was definite evidence of an embarrassingly large infusion or of infection, and, though recovery was slow, the vast majority did well. This was in accordance with Makins's advice based on experience in the Boer War. In the present war the practice in the Army has been to tap sterile *hæmothorax* except when small, and this course has not led to infection and has hastened recovery. In the trenches infection of a chest wound is much more prone to occur than was the case on the relatively sterile veldt.

DISEASES OF AIRMEN.

The chapter of aeroplane injuries and diseases—which from its interest may be briefly mentioned here—has been begun by Staff-Surgeon H. V. Wells.²¹ From leakage of petrol spray the pilot may become dizzy, and the exhaust gases from the engine—carbon monoxide and dioxide—may cause headache, drowsiness, and malaise. The rarefied atmosphere at great elevations may induce the symptoms well known in balloonists, and Wells refers to a case of frost-bite in an airman who had been exposed to 34° of frost at an elevation of 15,000 feet. Psychasthenic symptoms—namely, loss of self-confidence and the resulting mental worry (*aerosthenia*)—are not uncommon, and prove that the victim has mistaken his sphere of activity. Flying is undoubtedly the job of a young man under 30 years of age, and not every young man is temperamentally or physically fitted to carry it through. Perfect eyesight is necessary to ensure safe landing, correction with glasses being not without its dangers; perfect hearing is essential to detect the first indications of engine defect, and free movement of the joints of the lower limbs to control the steering-gear. Fits and tendency to faint absolutely deter the aspirant from the air service. In one remarkable instance at Haslar an airman who fainted, with the result that the aeroplane dived nose downwards 1200 feet into a ploughed field, escaped with such minor injuries that he was at first extremely loth to give up this branch of the service.

²⁰ Archibald, Hadfield, Logan, and Campbell: *Journ. Roy. Army Med. Corps*, 1916, xxvi., 695.

²¹ Wells, H. V.: *Journ. Roy. Nav. Med. Service*, London, 1916, ii., 65-71.

